3RD Quarterly Report – Public Page

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Project Title: *Improving Magnetic Flux Leakage In-Line Inspection Corrosion Sizing Using Phased Array Guided Ultrasonic Waves*

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In-line inspection (ILI) is an integral part of many pipeline company integrity management plans. The most common inspection technology for both natural gas and liquid pipelines is magnetic flux leakage (MFL). MFL was first used in the 1960s and was significantly improved in the 1980s and 1990s. While improvements are still being implemented, the performance capability of MFL tools has remained relatively unchanged for a decade. The major attribute of MFL is the ruggedness of the implementations that enable this technology to perform under the rigors presented by the pipeline environment. The most commonly reported deficiency of this technology is the lack of precision in reported sizes of the anomalies detected.

The goal of this development is to improve corrosion anomaly depth sizing of MFL tools by adding phased array Guided-Wave Ultrasonic inspection technology (GWUT). The anticipated improved accuracy provided by this ILI technology will help pipeline owners better assess corrosion anomalies and more accurately determine corrosion growth rates to enhance their integrity management programs.

The work completed throughout this quarter has produced valuable results that will play a critical role in the final design of a phased-array system that can be used with an ILI tool. Data acquisition rates and volumes were studied thoroughly to determine what the most feasible focusing methods are. It was found that the real-time phased array and the geometric array are the most practical for ILI applications. The amount of time required to acquire data for synthetic focusing is prohibitive at this time because the tool will have moved a significant distance before the data acquisition process is completed. A prototype omnidirectional electromagnetic acoustic transducer (EMAT) was built and demonstrated. This is a critical step toward the development of a phased-array system. Other EMAT coil designs were also presented for geometric focusing. It was determined that EMATs do not have enough bandwidth to effectively frequency tune and therefore a design was proposed such that an array of EMAT coils of different wavelengths are used to increase the frequency range over which tuning can be completed.